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FEAP
FACILITIES ENGINEERING APPLICATIONS PROGRAM

USER'S GUIDE

USER'S GUIDE: NONDESTRUCTIVE PAVEMENT EVALUATION

by

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U.S. Army Engineering and Housing Support Center
Fort Belvoir, VA 22060-5516

Innovative Ideas for the Operation, Maintenance, & Repair of Army Facilities

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The report provides a description of nondestructive pavement evaluation which involves testing a pavement with an impact loading device that measures pavement deflection, conducting a surface condition survey, and coring the pavement to verify pavement layer thickness. The data are used to determine the vehicle operations that will cause failure of the pavement sections evaluated, predict expected performance, and help determine maintenance and repair alternatives.

The description, applicability, benefits, limitations, costs, recommended uses, and location of demonstrations for the nondestructive pavement evaluation technology are discussed.

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USER'S GUIDE: NONDESTRUCTIVE PAVEMENT EVALUATION

PART I: EXECUTIVE SUMMARY

Description

Nondestructive pavement evaluation involves testing a pavement with an impact loading device that measures pavement deflections, conducting a surface condition survey, and coring the pavement to verify pavement layer thicknesses, thereby providing specimens for laboratory testing. The data collected from the field and laboratory testing are then used to determine the number of aircraft (or vehicle) operations for various aircraft (or vehicle) types and weights that will cause structural failure of each pavement section evaluated, aid in the prediction of the performance expected of the pavement, and help to determine maintenance and repair alternatives applicable to the pavement.

Application

The nondestructive testing (NDT) procedure is applicable to all pavements, but its greatest benefit is to the user on airfield pavements. Pavement evaluations are particularly necessary for Army airfield pavements due to the critical nature of their military mission. ER 1110-3-108 (Appendix A) requires Army airfield pavement evaluations to be performed by the US Army Engineer Waterways Experiment Station (WES). AR 420-72 states circumstances when an Army airfield evaluation is needed and minimum requirements for conducting condition surveys of roads and streets.

Benefits

There are two alternatives to performing an NDT evaluation of a pavement: (1) do nothing and (2) perform a destructive evaluation of the pavement. The benefits of performing an airfield evaluation far outweigh the initial savings of doing nothing. NDT evaluations provide many benefits to the operator of an Army airfield. From an airfield evaluation, the projected life of the

pavement can be estimated which is important to ensure that a failure does not occur during routine or mobilization missions. An airfield evaluation can also be used to project when major and minor maintenance should be performed on airfield pavements. By projecting future work, an airfield evaluation allows the operator to request and budget funds that will be required to maintain high-quality pavements. The prediction of pavement life also has the potential to save thousands of dollars in damage to aircraft, which might otherwise be operating on deteriorated or failed pavements.

The evaluation of airfield pavements is beneficial, and the NDT procedure should be used for evaluating the pavements. The NDT evaluation procedure is less costly, causes less interference with normal traffic, and provides more data than does destructive in-place field sampling (test-pit method). NDT also allows qualitative comparisons between pavement areas at a given project, thereby locating areas that may show signs of early distress and warrant further investigation and monitoring. The NDT evaluation procedure, by allowing for the conduct of numerous tests, reveals which parts of the pavements are in the best and the worst conditions structurally when it is not visually obvious. The ability to determine the capacity of specific pavement areas provides the airfield operator with sound choices among alternatives when funds for full maintenance are not available. The results of an NDT evaluation allow for the optimization of money as well as pavement life.

Limitations

The equipment and procedures required to conduct a complete pavement evaluation are specialized and would be beyond the expected capabilities of in-house personnel.

Costs

The costs of a pavement evaluation are dependent on the size of the pavement to be evaluated. The larger the area of the pavement to be evaluated, the less the cost per square yards. The reason the square yard cost decreases for larger areas is that the cost of mobilization and report production are relatively constant for any size pavement evaluation project.

A typical 500,000 sq yd airfield will cost approximately $50,000.00 for an evaluation.

Recommendation for Use

AR 420-72 requires the evaluation of airfield pavements be conducted every 5 years. Condition surveys are to be conducted at a minimum of every 3 years. When structural deficiencies are noted or major change in usage is planned, the need for an NDT evaluation should be triggered.

Due to the less critical importance of roads and streets as compared to airfield pavements, the NDT evaluation procedure is not applicable on a regular basis. However, evaluations of major roads and streets which are being considered for overlay may be conducted to provide results that can be used by the designer to select the optimum overlay thickness and thereby minimize life-cycle costs. Condition surveys, which can be conducted by in-house personnel, provide a means of maintaining a pavement management system that can be used to aid in the decision process for optimizing the use of limited funds for maintaining roads and streets.

Points of Contact

Points of contact regarding this technology include the following:

Technical:

Director
US Army Engineer Waterways Experiment Station
ATTN: CEWES-GP-T (Mr. William P. Grogan)
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
Telephone: (601) 634-2226
Facsimile: (601) 634-3020

US Army Engineering and Housing Support Center:

Commander
US Army Engineering and Housing Support Center
ATTN: CEHSC-FB-P (Mr. Stan Nickell)
Fort Belvoir, VA 22060-5516
Telephone: (703) 355-0040
Facsimile: (703) 780-5935

Points of contact at the respective installations where the demonstration projects were conducted include the following:

Airfield Evaluation:

Commander
24th Infantry Division-Fort Stewart
ATTN: AFZP-DER (Mr. Tommy Houston)
Fort Stewart, GA 31314-5000
Telephone: (912) 767-2010

Roads and Streets Evaluation:

Headquarters, Fort McPherson
Directorate of Engineering and Housing
ATTN: AFZK-EH-E Bldg 358 (Mr. Mike Hutt)
Fort McPherson, GA 30330-5000
Telephone: (404) 752-3487

PART II: PREACQUISITION

Description of Technology

The equipment involved in NDT evaluations include a falling weight deflectometer (FWD) and a small core rig. The FWD provides data for estimating the structural strength of pavements. The core rig is used to verify pavement thicknesses and for direct sampling to obtain pavement specimens for laboratory testing.

The FWD is a trailer-mounted impact load device that applies a single transient load of approximately 25 to 30 msec duration. The dynamic force is applied by the FWD to the pavement surface by dropping a weight onto a set of rubber cushions which result in an impulse loading on an underlying circular plate 11.8 in. in diameter in contact with the pavement. The applied force and resulting pavement deflection are measured with load cells and velocity transducers, respectively. The drop height of the weights can be varied to produce a force from 0 to approximately 25,000 lb. The system is controlled with a portable computer which also records the output data. Measured velocities are electronically integrated to determine deflections at the center of the load plate (D1) and at distances of 12, 24, 36, 48, 60, and 72 in. (D2-D7) from the center of the load plate in order to obtain deflection basin measurements. The deflection basin measurements are used to determine the moduli of each pavement layer through a back-calculation procedure that determines the modulus of the layers, including the subgrade in the pavement system. Impulse stiffness modulus (ISM) values are calculated based on the slope (load/deflection) of the plot of the impulse load versus the deflection at the first sensor (D1). The ISM is used to group test results in pavement sections with similar strength for evaluation purposes. The ISM can also be used to find areas of relatively different strengths. Weak areas identified by low ISM values can be identified for further study and observation.

A small trailer-mounted drill rig is used to cut cores from pavements being evaluated. The cores provide a means of determining the thicknesses and other characteristics of the various layers of the pavement system. Selected core specimens are used for laboratory testing. The pavement layer thicknesses and the laboratory results are used in the back-calculation

procedure that determines the layer properties used in evaluating the pavements.

From the data collected with the NDT equipment and the drill rig, the structural capacity of the pavements tested can be determined. The structural capacity of the pavements is determined in terms of load-carrying capacity and allowable passes of a design aircraft (or vehicle) and overlay thicknesses required for the pavement to sustain a specified number of passes of a design aircraft (or vehicle). The NDT evaluation procedure for airfields also provides a method of determining the pavement classification number (PCN) of a pavement. The PCN is a code that relates the load-carring capacity of a pavement to an aircraft with an aircraft classification number (ACN). If the PCN is greater than the ACN, then the pavement should be able to withstand the load of that aircraft. For further information concerning the ACN/PCN system see TM 5-826-5/AFM 88-24, Chap. 5 (Headquarters, Departments of the Army and the Air Force, Draft). TM 5-826-5/AFM 88-24, Chap. 5 (Headquarters, Departments of the Army and the Air Force, Draft) explains in detail the NDT procedures and the results of an NDT evaluation.

Airfield condition surveys require no special equipment and are conducted in accordance with TM 5-826-6/AFR 93-5 (Headquarters, Departments of the Army and the Air Force 1989). Road and street condition surveys are conducted in accordance with TM 5-623 (Headquarters, Department of the Army 1982). The condition survey involves dividing a network of pavements into features. A feature is defined as an area of pavement of like cross section subjected to similar traffic. Features are then divided into sample units for survey purposes. Based on the total number of sample units in a feature, a specified number of sample units are surveyed. The survey includes listing the types, severity level, and quantity of surface distresses observed in each sample unit. Based on the type, severity level, and quantity of distresses found in all of the sample units surveyed for a pavement feature, a pavement condition index (PCI) is determined for the feature. The PCI is a rating from 100 to 0, with 100 being a perfect pavement and 0 being the worst condition a pavement can be rated. The results of the condition survey are normally stored in a pavement management data base system, such as PAVER or Micro PAVER. The trend of the condition index over time for a particular pavement can be used to

predict the future condition of that pavement and aid in selecting optimum maintenance procedures that should be performed.

Application

Because of the required mission, the need to be able to provide rapid deployment, and the importance of safe pavements, nondestructive Army airfield pavement evaluations should be scheduled periodically. AR 420-72 (Headquarters, Department of the Army, 1991) specifies that condition surveys be conducted every 3 years on Army airfields and NDT evaluations be conducted every 5 years. NDT evaluations may be required to be conducted sooner if the condition survey indicates structural deficiencies or if there is a substantial change in mission requirements. Over 50 CONUS airfields have been evaluated under a program sponsored by Headquarters, US Army Corps of Engineers. Reports documenting these evaluations have been used by many installations to justify Army airfield maintenance and repair work as well as rehabilitation and reconstruction projects required for continued mission support.

Limitations/Disadvantages

The major disadvantage/limitation of this technology is not the technology itself, but rather the implementation of this technology. Because specialized equipment is necessary to collect the field data, and specialized training is needed for evaluating the NDT data, it is likely that this technology will need to be performed by other than in-house personnel. In-house personnel will not have the capabilities to perform a complete NDT evaluation. However, in-house personnel can learn the skills needed to perform PCI surveys. Part III of this report lists available sources for obtaining the training needed to be able to perform PCI surveys.

Demonstration/Implementation Sites

To demonstrate the evaluation of an Army airfield, Wright Army Airfield was evaluated in June 1988. The results of the evaluation at Wright Army

Airfield were reported in Miscellaneous Paper GL 89-10, "Airfield Pavement Evaluation, Wright Army Airfield, Fort Stewart, Georgia, Facilities Engineering Application Program (FEAP)" (Harrison 1989).

To demonstrate the evaluation of roads and streets, several roads and streets at Fort Gillem, Georgia were evaluated. The results of the roads and streets evaluation were reported in Miscellaneous Paper GL-90-15, "Nondestructive Pavement Testing and Evaluation: Facilities Engineering Applications Program (FEAP) Demonstration" (Grogan 1990).

Life-Cycle Costs and Benefits

In regards to airfield evaluations, the pertinent information provided by an NDT evaluation coupled with the prevention of cost related to aircraft damage is more than adequate to justify the cost of an airfield evaluation. The cost for a complete NDT evaluation of a typical airfield with approximately 500,000 sq yd of pavement would be $50,000.00. This is a cost of $0.10/sq yd. If the evaluation is done once every 5 years, the cost is $0.02/sq yd/year. The 1988 Red Book indicates Army pavement maintenance costs average $0.20/sq yd/year, and the $0.02 annual investment presently will more than pay for itself in reducing overall maintenance costs by making possible optimally timed maintenance.

In order for a road maintenance, rehabilitation, or upgrade project to justify the cost of an NDT evaluation, it must be of a magnitude great enough to warrant the cost. Prime candidates for NDT evaluation of roads and streets include critical roads and streets and large jobs where an optimization of required new pavement or overlay pavement thickness could save a great deal of money.

Advantages/Benefits

An NDT evaluation provides data necessary to allow the installations pavement engineer to make cost effective, prudent decisions regarding the pavements that require maintenance, repair, rehabilitation, or reconstruction. Other benefits realized by the NDT evaluation procedure include the amount of data available to the evaluating engineer,

reduced down time of pavements, improved war fighting capability through improved operational efficiency, and improved safety. NDT provides numerous data points to base an evaluation, as opposed to one or two data points that would be available from the destructive test-pit method of evaluating a pavement. The time a pavement is not in service is minimal with NDT, as each test takes less than 1 min to perform. The destructive test-pit method can require the closure of a pavement for a full day and longer in some circumstances. The improved war fighting capability, operational efficiency, and safety are the result of knowledge obtained concerning the capacity and limits of the pavements and employing that information to best use the pavements. For example, the results of the NDT evaluation can be used to predict the operational life of a pavement that may be required for a mobilization exercise.

In general, the results of this demonstration are applicable to all installations. This technology can be used for any pavement that is being considered for maintenance, rehabilitation, or upgrading or where knowledge of the structural capacity of the pavement would be beneficial.

PART III: ACQUISITION/PROCUREMENT

Potential Funding Sources

Typically, installations fund the implementation of pavement evaluations and maintenance out of their annual budgets. Implementation of pavement evaluation technology may qualify for dedicated funds authorized under special incentive programs. Examples of funding sources are as follows:

a. Productivity program. See AR 5-4, Department of the Army Productivity Improvement Program for guidance to determine if the project qualifies for this type of funding.

b. Facilities Engineering Applications Program (FEAP). In the past, a number of pavement and railroad maintenance projects located at various installations were funded with FEAP demonstration funds. At that time, emphasis was placed on demonstrating new technologies to the Directorate of Engineering and Housing (DEH) community. Now that these technologies have been demonstrated, the installations will be responsible for funding their projects through other sources. However, emphasis concerning the direction of FEAP may change in the future; therefore, FEAP should not be ruled out as a source of funding.

c. Special programs. Examples of these are as follows:
   (1) FORSCOM program to provide facility repairs to support mobilization which may include rehabilitation of airfields or other pavements.
   (2) Safety program which may include the repair of unsafe/deteriorated pavements.
   (3) Security upgrade which may include the repair or enlargement of fencing.

d. Reimbursable customer. Examples of this source are roads to special function areas such as family housing or schools and airfield pavements required to support logistical operations.

e. Special requests from MACOMS.

f. Year end funds. This type funding should be coordinated with the MACOMS to ensure that the funds will not be lost after a contract is awarded (funding source request that funds be returned).

g. Operations and Maintenance (Army). These are the normal funds used for funding pavement and railroad projects.

Technology Components and Sources

In general, a complete NDT evaluation of a network of pavements is beyond the in-house DEH resources and capabilities. However, the pavement condition survey may be done by in-house personnel after studying the appropriate manuals which were identified in the Description of Technology section. Also, there are classes offered each year on how to perform pavement condition surveys. For a schedule of appropriate classes, contact Joan Cornell at (217) 333-2881 at the University of Illinois, Conferences and Institutes Support Center. WES also offers classes in pavement technology; for more information, contact Jim Perkins at (601) 634-3350. Most installations have had an initial evaluation conducted; therefore only periodic updates need to be made by surveying the appropriate sample units. There are also many consulting engineering firms that have the ability to conduct condition surveys. The Micro PAVER database system which runs on a microcomputer can be obtained for use by any installation to store data obtained from condition surveys and produce applicable reports. To obtain a copy of the Micro PAVER computer program, contact Rebecca Richardson at the University of Illinois, Conferences and Institutes Support Center. The cost for the Micro PAVER computer program is $350.00 for the initial subscription and $200.00 per year to keep the subscription current.

The NDT testing portion of the evaluation procedure can be provided by some engineering firms. Example NDT reports may be obtained from WES to aid the DEH in determining a scope of work. WES has the capability to provide these services, and evaluations of Army airfields must be conducted by WES as required in ER 1110-3-108 (Headquarters, Department of the Army 1988).

Coring of pavements to provide input to the evaluation procedure can be performed by almost any engineering firm, particularly if it has geotechnical capabilities.

For Army airfield pavements, WES will conduct the condition survey, core the pavements, run laboratory tests on the specimens obtained from coring, perform NDT, evaluate all the results, and present all the findings in a formal report. WES can also conduct any or all phases of testing and evaluating pavements other than airfields. The pavement evaluations,

including Army airfields, conducted by WES are performed on a cost reimbursable basis.

Procurement Documents

There are no guide specifications, GSA listings, or vendors lists. Appendix B contains an example of a Military Interdepartmental Purchase Request (MIPR). The example MIPR contains the information necessary to transfer funds to WES for conducting a pavement evaluation.

Procurement Scheduling

Projections determined from condition survey as well as regularly scheduled evaluations should be planned as far in advance as possible. If WES is to provide evaluation services, it is advisable to provide a 3-month lead time from requesting the evaluation before it can be expected that the evaluation will be performed. For OCONUS sites, a 6-month lead time is beneficial.

If roads and streets are to be evaluated, normal contracting procedures to obtain the services of an engineering firm should be pursued. Most installations have a task order contract with an engineering firm to provide services as needed; most of these firms should be able to provide the necessary services either in-house or by contracting with another firm.

PART IV: POST ACQUISITION

Initial Implementation

To implement this technology, the user should contact WES through its supporting US Army Corps of Engineers military district or its task order engineering firm. For storing the results of the condition survey, the user should have the software and hardware necessary to run Micro PAVER. The Micro PAVER program was developed for operation on an IBM compatible personal computer that runs MS-DOS. A hard disk drive is required with 20 megabytes or higher storage capacity recommended and 640K RAM memory. It would also be beneficial if the user attended a Micro PAVER course to gain knowledge in pavement management technology and the condition survey procedure.

Operation and Maintenance of Technology

The user should ensure that all condition surveys are conducted as scheduled. Updates should be incorporated into the pavement management data base. Reports from the data should be used to determine when future condition surveys should be conducted and when NDT evaluations are appropriate.

Service and Support Requirements

The upkeep of the database and the production of appropriate reports need to be maintained by a single individual with computer experience, who has attended a PAVER course, and has some experience with pavement management.

Performance Monitoring

The user can ensure that the technology is being implemented for maximum effect by using the results as a basis for decisions on (1) pavement maintenance investments, (2) limitations of maximum loads or other restrictions on use of pavements, and (3) decisions to close a facility for aircraft safety reasons. In terms of an NDT evaluation, recommendations from the resulting report should be implemented as soon as possible to ensure that

the full benefits of preventive maintenance in maintaining the structural capacity of the pavements are realized. If the user is able to predict the maintenance and repair work required to provide satisfactory pavements and identify the consequences of not investing the required resources, then the technology would be considered to be performing adequately.

REFERENCES

Grogan, W. P. 1990 (Sep). "Nondestructive Pavement Testing and Evaluation: Facilities Engineering Applications Program (FEAP) Demonstration," Miscellaneous Paper GL-90-15, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Harrison, J. A. 1989 (Jun). "Airfield Pavement Evaluation, Wright Army Airfield, Fort Stewart, Georgia, Facilities Engineer Application Program (FEAP)," Miscellaneous Paper GL-89-10, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Headquarters, Department of the Army. 1982 (Mar). "Pavement Maintenance Management," Technical Manual TM 5-623, Washington, DC.

_____. 1988 (Jan). "Engineering and Design Evaluation of Military Airfield Pavements," Engineering Regulation ER 1110-3-108, Washington, DC.

_____. 1991 (Mar). "Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances," Army Regulation 420-72, Washington, DC.

Headquarters, Departments of the Army and the Air Force. 1989 (Jul). "Procedures for US Army and US Air Force Airfield Pavement Condition Surveys," Technical Manual TM 5-826-6/AFR 93-5, Washington, DC.

_____. Draft. "Nondestructive Procedures for Airfield Pavement Evaluation," Technical Manual TM 5-826-5/AFM 88-24, Chap. 5, Washington, DC.

APPENDIX A: ENGINEERING REGULATION ER 1110-3-108

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

ER 1110-3-108

CEEC-EG

Regulation
No. 1110-3-108

29 January 1988

Engineering and Design
EVALUATION OF MILITARY AIRFIELD PAVEMENTS

1. Purpose. This regulation sets forth policy and responsibilities for evaluation of military airfield pavements.

2. Applicability. This regulation applies to all HQUSACE/OCE elements and field operating activities (FOA) having military construction and design responsibility.

3. General. Information concerning aircraft inventory, aircraft passes and aircraft operations shall not be released outside U.S. Government agencies.

4. Action to be Taken. Unless otherwise approved by CEEC-EG, all U.S. Army Airfield Pavement Evaluation will be performed by the U.S. Army Corps of Engineers Waterways Experiment Station. Portions of the airfield pavement evaluation reports containing references to aircraft inventory, passes and operations shall not be released outside U.S. Government agencies. U.S. Army Airfield Pavement Condition Index without reference to aircraft operations may be released to Architect/Engineer with the approval of CEEC-EG. For airfields which are not U.S. Army, any release of pavement evaluation information made outside of the Department of the Army shall be made by the owner of the airfield, not by the U.S. Army Corps of Engineers.

FOR THE COMMANDER:

JAMES R. WHITLEY
Colonel, Corps of Engineers
Chief of Staff

APPENDIX B: MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

1. PAGE 1 OF ( ) PAGES

2. FSC	3. CONTROL SYMBOL NO.	4. DATE PREPARED	5. MIPR NUMBER	6. AMEND NO.
	(As appropriate)	(As appropriate)	(As appropriate)	(Basic)

7. TO: (USAE Waterways Experiment Station
ATTN: CEWES-RS
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
Phone: 601-634-4277 Fax: 601-634-3979)

8. FROM: *(Agency, name, telephone number of originator)*
(Address, phone number, and POC of requesting agency)

9. ITEMS ☐ ARE ☐ ARE NOT INCLUDED IN THE INTERSERVICE SUPPLY SUPPORT PROGRAM AND REQUIRED INTERSERVICE SCREENING ☐ HAS ☐ HAS NOT BEEN ACCOMPLISHED.

ITEM NO. *a*	DESCRIPTION *(Federal stock number, nomenclature, specification and/or drawing No., etc.)* *b*	QTY. *c*	UNIT *d*	ESTIMATED UNIT PRICE *e*	ESTIMATED TOTAL PRICE *f*
(1.	Funds are provided to perform airfield pavement evaluation (nondestructive testing, structural analysis, and condition survey) on appropriate airfield, road, or street names at appropriate installation name. POC at WES is Bill Grogan, CEWES-GP-T, 601-634-2226.				(Price as quoted by POC at WES)
2.	This order will not be considered an obligation until the DD Form 448-2 (Acceptance of MIPR) is signed by the performing agency and is received by the office in Block 8 above.				
3.	Expiration date of funds as appropriate.				
4.	Additional restrictions required by local funding office as appropriate.)				
	EXAMPLE MIPR: FILL OUT ALL ITEMS IN "( )"				

10. SEE ATTACHED PAGES FOR DELIVERY SCHEDULES, PRESERVATION AND PACKAGING INSTRUCTIONS, SHIPPING INSTRUCTIONS AND INSTRUCTIONS FOR DISTRIBUTION OF CONTRACTS AND RELATED DOCUMENTS.

11. GRAND TOTAL (Quoted price)

12. TRANSPORTATION ALLOTMENT *(Used if FOB Contractor's plant)*

13. MAIL INVOICES TO *(Payment will be made by)*
(Address of requesting agency's appropriate finance office)
PAY OFFICE DODAAD

14. FUNDS FOR PROCUREMENT ARE PROPERLY CHARGEABLE TO THE ALLOTMENTS SET FORTH BELOW. THE AVAILABLE BALANCES OF WHICH ARE SUFFICIENT TO COVER THE ESTIMATED TOTAL PRICE.

ACRN	APPROPRIATION	LIMIT / SUBHEAD	SUPPLEMENTAL ACCOUNTING CLASSIFICATION	ACCTG STA DODAAD	AMOUNT
			(Appropriate accounting classification number)		(As appropriate)

15. AUTHORIZING OFFICER *(Type name and title)*	16. SIGNATURE	17. DATE
(As appropriate)	(As appropriate)	(As appropriate)

DD FORM 1 JUN 72 448 PREVIOUS EDITION IS OBSOLETE.

APPENDIX C: FACT SHEET

FACILITIES ENGINEERING APPLICATIONS PROGRAM

Fact Sheet

PRR-2

March 1990

Nondestructive Pavement Evaluation

Description of Technology

Pavement evaluation using nondestructive testing equipment can determine the load-carrying capacity of pavement systems or the overlay requirements for strengthening pavements that are below design strength. The results of such an evaluation provide the facility engineer with information on the maintenance or rehabilitation that may be required to keep a pavement serviceable.

Status of Demonstration

The U.S. Army Waterways Experiment Station (WES) conducted a nondestructive test on Army airfield pavements at Fort Stewart, GA, in June 1988. In June 1989 nondestructive evaluation of roads and streets at Fort Gillem, GA, was demonstrated. The pavements were tested with a Dynatest Model 8000 falling weight deflectometer and cored with a trailer-mounted drill rig. A pavement condition index (PCI) survey was also conducted for use with the Pavement Maintenance Management System (PAVER).

The falling-weight deflectometer data was used to calculate the strength of the pavement layers to determine the load-carrying capacity of the pavement sections. The cores were used to verify the pavement layer thicknesses. Laboratory tests were performed on selected cores to determine either flexural strength or bituminous mix properties.

The Fort Stewart airfield evaluation report, MP GL-89-10, was published in June 1989. Analysis of the road and street test results from Fort Gillem is now in progress. In addition, work on a videotape of the procedures and benefits of nondestructive testing has been initiated.

Benefits of Technology

The nondestructive pavement testing procedure is less costly, causes less interference with normal traffic, and provides the facility engineer with more useful data than does destructive in-place field sampling. Nondestructive testing also allows qualitative comparisons between pavement areas, thereby locating areas that may show early distress and warrant further investigation.

Points of Contact

William P. Grogan or Richard H. Grau, U.S. Army Engineer Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, COMM 601-634-2226, toll-free 800-522-6937 ext 2226.

For information on FEAP projects, contact the FEAP Information Center, P.O. Box 4005, Champaign, IL 61824-4005 or 217-352-6511, ext. 386. Toll-free 1-800-USA-CERL, ext. 386 (outside Illinois) and toll-free 1-800-252-7122, ext. 386 (within Illinois).

Ken Gregg, U.S. Army Engineering and Housing Support Center,
COMM 703-355-3582.